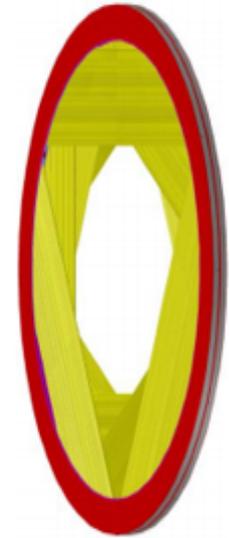
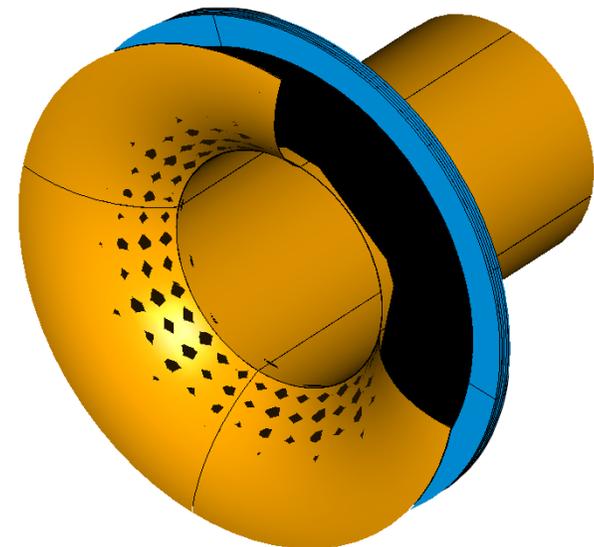


# Mu2e-II Tracker Workgroup Report

Dan Ambrose  
University of Minnesota  
Dec 9<sup>th</sup>, 2020



# Mu2e-II Tracker Workgroup:

**Join the list-serve** : [MU2EII-TRACKER@fnal.gov](mailto:MU2EII-TRACKER@fnal.gov)

**Meeting Schedule** : Bi-weekly Tuesdays 11:00 AM CST. Next one is Jan 5<sup>th</sup>.  
Zoom link sent through list-serv

We would gladly welcome more interested people.

Please contact Gianfranco([giovanni.tassielli@le.infn.it](mailto:giovanni.tassielli@le.infn.it) ), me([ambr0028@umn.edu](mailto:ambr0028@umn.edu)), or come to the workgroup meeting though the list-serve

# Completed First Tracker Workgroup Workshop Dec 8th

**Our first workshop was a success.**

**We had 4 talks and some good discussions.**

**We had 14 attendees.**

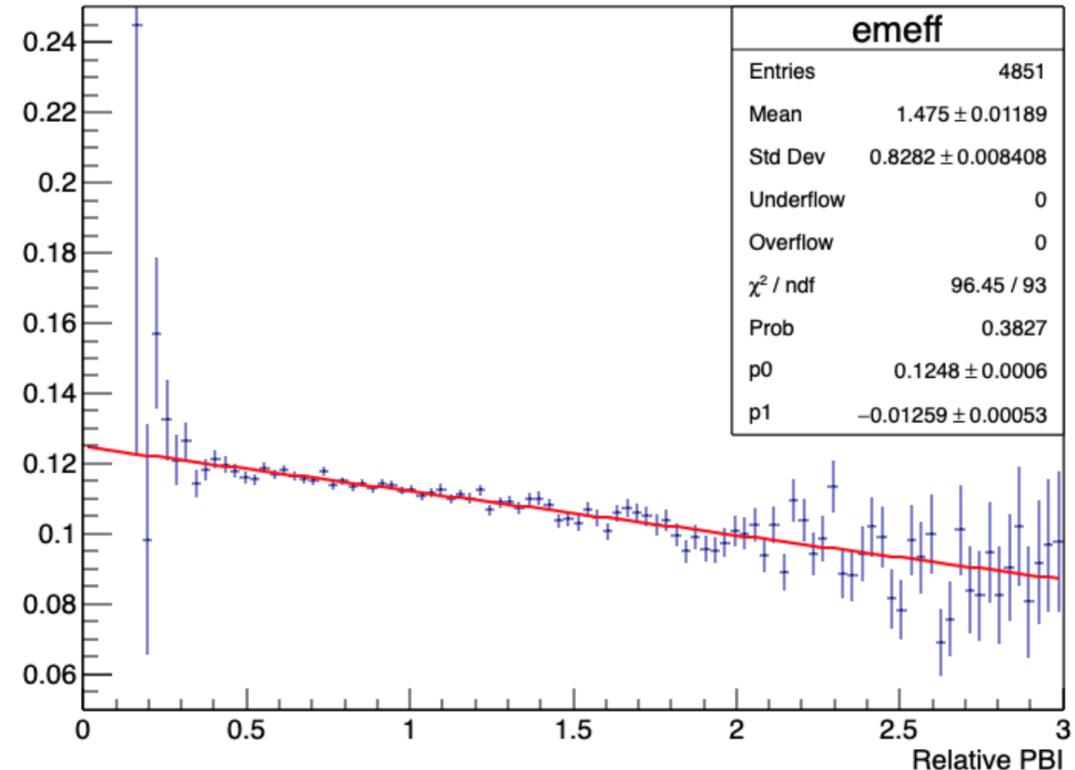
**Slides and a zoom recording of the meeting can be found at  
(<https://indico.fnal.gov/event/46751/>)**

**While at this point there were not a lot of results,  
people presented excellent plans and ideas on moving forward.**

# Mu2e-II Tracker Requirements

- Improved Momentum resolution
  - Needed for distinguishing increased DIO background
  - Looking into :
    - Reducing detector material(ex:Thinner straws)
    - Different Geometry
    - Pursuing alternative new technologies
- Survive the increased charge deposition and beam flash radiation :
  - Develop radiation-resistant front-end electronics
    - ASICS
    - DC-DC converter
    - Optical components
- Increased hit occupancy and timing window
  - 4x increase in Proton bunch intensity reduces reconstruction efficiency by 30% (extrapolated)
  - Current design and software is capable of this

Efficiency for  $\mu^+ \rightarrow e^-$  vs PBI



MDC2018, Dave Brown  
Docdb# 28281

# LDRD Straws and Material Studies Update – Brendan Casey

- Designing and constructing a permeation test stand to try and understand what the minimum thickness of coating we can get away with and also study gap/overlap/butt seams.
  - We started this but the engineer got switched so we are basically starting again
  - This would use ~2in square samples so there are lots of vendors who can do this coating.
- Looking into different metal deposits
- Decided to move forward with purchasing some aluminum only Mylar for tests and a possible small prototype
- Progress is expected to pick up after the holidays.

# Tracker Simulation Update – Gianfranco Tassielli

Goal is to have a simulation to test different options including different technologies.

- Mu2e configuration with reduced straw material
- Drift chamber alternative
- Radial TPC based on u-well technologies
- A tracker based on light Si sensors (Mu3e like)

Simulations will be used to test momentum resolution and expected radiation amounts.

## **geant4 Simulation status:**

It is currently maintained (as ex. it is used for some FCC studies)

debugging is on going for:

- Transverse geometry
- track fit in the Mu2e configuration

## **FastSim status:**

It was not maintained for a long time

Recently Dave updated and compiles using cmake  
work is needed to remove old dependences  
recover and test old Mu2e work

## **Timeline :**

- Set and debug geant4 simulation over the next week
- Extract preliminary results comparisons for next Mu2e-II workshop
- Look into FastSim

**Simulation help welcome!**

# Straw Construction Ideas-Dan Ambrose

Discussed ideas for handling the thinner straws :

- Installing straws before removing support paper
- Installing inflated straws
- Pulling a vacuum on outside of straws while installing termination and wires

Preliminary prototype stretch measurements

- stretch coefficient consistent with thicker Mu2e straws
- Force required before straw moves beyond elastic region (500 gf) is  $\sim 1/3$  thicker straw value.



**Unexpected behavior as 500g tensioning off axis significantly warped straw**

# What could we do with more time?

**With the possibility of delay in Snowmass, we talked about how that would affect our goals as a workgroup.**

**There is a lot of simulation work to do and our current experts time is limited by other commitments.**

- Additional time to simulate different tracker geometries and technologies will give us a better project.**

**Building and testing a prototype using the thinner straws.**

- This was going to be very ambitious to have one completed by this summer but becomes a real possibility with a delay.**

# Summary

- **Plans are in place to get results in both material tests and simulations for upcoming meetings**
- **Additional time could lead to a wider range of simulations and material tests with prototypes**
- **Many good ideas, members sounded optimistic about increase progress speed moving forward.**
  - **Let us know if you are interested in helping**